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IS 12105 (1987): Methods of test for valves of automotive air brake systems [TED 4: Automotive Braking Systems]

**“ज्ञान से एक नये भारत का निर्माण”**

Satyanaaranay Gangaram Pitroda

**Invent a New India Using Knowledge**



**“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”**

Bhartṛhari—Nītiśatakam

**“Knowledge is such a treasure which cannot be stolen”**





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*Indian Standard*

## METHODS OF TEST FOR VALVES OF AUTOMOTIVE AIR BRAKE SYSTEMS

**1. Scope** — Specifies the methods of test for valves used in air brake systems of automotive vehicles designed to operate up to 8.5 bar nominal pressure.

### **2. General Requirements**

**2.1 Temperature** — Unless otherwise specified, all tests shall be conducted at room temperature varying between 15 to 45°C.

**2.2 Mounting** — All tests shall be conducted with the unit mounted essentially as in service.

**2.3 Leakage Measurement** — All leakage rates shall be expressed in standard cubic centimetres per minute (cc/min) of free (atmospheric) air. Various methods may be utilized, such as pressure drop in a specific volume or by soap bubbles or by flow meters.

**2.4 Pressure Units** — All pressure units shall be expressed as gauge pressure (that is, above atmospheric pressure), unless otherwise specified.

**2.5 Cycle Rate for Endurance Test** — All endurance tests shall be carried out at a rate agreed upon by the valve manufacturer and the purchaser and shall be decided to ensure that no abnormal effects are introduced.

**2.6 Air Supply** — Unless otherwise specified, the air supply shall be filtered and shall be free from condensate.

**2.7 Test Sequence** — Unless otherwise specified, the same valve need not be used for more than one test.

**2.8 Multiple Function Valves** — Valves with multiple function shall be tested for all applicable tests as agreed upon by the valve manufacturer and the purchaser.

**2.9 Delivery Reservoir Volume for Endurance Test** — The reservoir capacity on the delivery side of valve for all endurance tests shall be agreed upon by the valve manufacturer and the purchaser.

### **3. Test Procedures**

**3.1 Performance Test** — The test and test procedure for the performance of input-output characteristics shall be determined by the intended design and functions as agreed upon by the valve manufacturer and the purchaser. A typical characteristic is comparison of input pressure, effort or travel versus output pressure (application and release).

#### **3.2 Leak Test**

**3.2.1 Pilot operated or manually operated valves** — Graduating type.

##### **3.2.1.1 Leak test in zero delivery pressure condition**

a) With low supply pressure (1 bar) at the inlet port(s) and delivery open to atmosphere, leakage shall be measured and recorded.

b) With full supply pressure at the inlet port(s) and delivery open to atmosphere, leakage shall be measured and recorded.

**3.2.1.2 Leak test in balanced condition** — With full supply pressure at the inlet port, the valve shall be actuated to increasing delivery pressures of 1 bar and 4 bar. Leakage shall be measured and recorded.

**3.2.1.3 Leak test in full delivery condition** — With full supply pressure at the inlet port, the valve shall be actuated to attain full delivery pressure. Leakage shall be measured and recorded.

**3.2.2 Pilot operated or manually operated valves — Non-graduating type ( ON-OFF type ).**

**3.2.2.1 Leak test in zero delivery pressure condition**

- a) With low supply pressure ( 1 bar ) at the inlet port(s) and delivery open to atmosphere, leakage shall be measured and recorded, and
- b) Leakage shall be measured and recorded with full supply pressure at the inlet port and delivery open to atmosphere.

**3.2.2.2 Leak test in full delivery condition** — With full supply pressure at the inlet port, the valve shall be actuated to attain full delivery pressure. Leakage shall be measured and recorded.

**3.2.3 Direction control valves**

**3.2.3.1 Low pressure leak test** — With 1 bar pressure at the inlet, leakage shall be measured and recorded.

**3.2.3.2 Intermediate pressure leak test** — With 4 bar pressure at the inlet, leakage shall be measured and recorded.

**3.2.3.3 Full pressure leak test** — With full air pressure at the inlet, leakage shall be measured and recorded.

**Note** — Valves with two independent inlet ports shall be tested with one inlet port pressurized and the second open to atmospheric pressure. These valves shall then be retested with the second inlet port pressurized and the first port open to atmospheric pressure.

**3.2.4 Automatic pressure regulating valves**

**3.2.4.1** With an air pressure level to the inlet port maintained at 1 bar ascending and descending prior to the automatic actuation point, leakage shall be measured and recorded.

**3.2.4.2** With full air pressure at the inlet port, leakage shall be measured and recorded.

**3.3 Endurance Test**

**3.3.1 Endurance of graduating type of valves** — With an air pressure of 8.5 bar at the inlet port(s), the valve shall be cycled to partial/full application. The distribution shall be agreed upon by the valve manufacturer and the purchaser.

**3.3.2 Endurance of non-graduating type of valves** — With an air pressure of 8.5 bar at the inlet port, the valve shall be cycled to full delivery pressure.

**3.3.3 Post endurance test** — The valve shall be tested as per 3.1 and 3.2.

**3.4 Low Temperature test**

**3.4.1** The valve shall be kept in a chamber maintained at a temperature of -40°C for 24 hours and shall be tested for leakage as per 3.1 and 3.2.

**3.4.2 Low temperature functional test** — As agreed between the valve manufacturer and the purchaser.

**3.4.3** The valve shall then be allowed to return to room temperature and tested in accordance with 3.1 and 3.2.

**3.5 High Temperature Test**

**3.5.1** The valve shall be kept in a chamber maintained at a temperature of 70°C at 24 hours. The valve at 70°C shall be tested for leakage as per 3.2.

**3.5.2 High temperature functional test** — As agreed to between the valve manufacturer and the purchaser.

**3.5.3 High temperature endurance** — With the surrounding temperature and supply air maintained at 70°C and with full supply pressure, the valve shall be cycled from 0 bar to full delivery pressure.

**3.5.4** The valve shall then be allowed to return to room temperature and tested as per 3.1 and 3.2.

**AMENDMENT NO. 2 FEBRUARY 2009**  
**TO**  
**IS 12105 : 1987 METHODS OF TEST FOR VALVES OF**  
**AUTOMOTIVE AIR BRAKE SYSTEMS**

(*Page 2, clause 3.3.1, first sentence*) — Substitute ‘With an air pressure equal to Max system pressure of the vehicle at the inlet port(s),’ for ‘With an air pressure of 8.5 bar at the inlet port(s)’.

(*Page 2, clause 3.3.2, first sentence*) — Substitute ‘With an air pressure equal to Max system pressure of the vehicle at the inlet port’ for ‘With an air pressure of 8.5 bar at the inlet port’.

(TED 4)

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Reprography Unit, BIS, New Delhi, India

**AMENDMENT NO. 1 NOVEMBER 1990**  
**TO**  
**IS 12105:1987 METHODS OF TEST FOR**  
**VALVES OF AUTOMOTIVE AIR BRAKE SYSTEMS**

(Page 3, clause 3.9) - Insert the following  
after 3.9:

'3.9.1 The duration of the test shall be at least  
for 72 h.

3.10 The fasteners shall be robust in construction  
capable of withstanding any vibrations and shall be  
tightened to a torque value specified by the valve  
manufacturer.'

(TED 4)

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**Reprography Unit, BIS, New Delhi, India**

### 3.6 Pressure Test

#### 3.6.1 Over pressure test

##### 3.6.1.1 Pilot operated or manually operated valves

- a) *Zero delivery pressure condition* — An air pressure of 11.5 bar shall be applied and maintained for ten seconds at the inlet port with no pressure in delivery.
- b) *Full delivery pressure condition* — An air pressure of 11.5 bar shall be applied and maintained for ten seconds at the inlet port with full pressure in delivery and control port (if applicable).
- c) The valve shall then be tested as per 3.1 and 3.2.

##### 3.6.1.2 Direction control valves and automatic pressure regulating valves

- a) An air pressure of 11.5 bar shall be applied and maintained for ten seconds at the inlet port.
- b) The valve shall then be tested as per 3.1 and 3.2.

**Note** — Valves with two independent inlet ports shall be tested with one inlet port pressurized and the second open to atmospheric pressure. These valves shall then be retested with the second inlet port pressurized and the first port open to atmospheric pressure.

#### 3.6.2 High pressure test

##### 3.6.2.1 Pilot operated or manually operated valves

- a) *Zero delivery pressure condition* — An hydrostatic pressure of 20 bar shall be applied at a uniform rate of 65 bar/min at the inlet port with no pressure in delivery port. The valve shall be checked for leakage and any permanent damage.
- b) *Full delivery pressure condition* — An hydrostatic pressure of 20 bar shall be applied at a uniform rate of 65 bar/min at the inlet port with full pressure in delivery and control port (if applicable). The valve shall be checked for leakage and any permanent damage.

##### 3.6.2.2 Direction control valves and automatic pressure regulating valves — An hydrostatic pressure of 20 bar shall be applied at a uniform rate of 65 bar/min at the inlet port. The valve shall then be checked for leakage and any permanent damage.

**Note** — Valves with two independent inlet ports shall be tested with one inlet port pressurized and the second open to atmospheric pressure. These valves shall then be retested with second inlet port pressurized and the first port open to atmospheric pressure.

#### 3.7 Installation load test — The procedure for this test shall be determined by the intended design and function as agreed upon by the valve manufacturer and the purchaser, taking into consideration operating and vibration loads.

#### 3.8 Dust test — The procedure for this test shall be determined by the intended design and function as agreed upon by the valve manufacturer and the purchaser.

#### 3.9 Salt spray test — The valve shall be disassembled and the component parts subjected to salt spray test in accordance with IS : 9844-1984 'Methods of testing corrosion resistance of electroplated and anodized aluminium coatings by neutral salt spray test'. Parts shall be visually inspected and extent of any corrosion shall be noted down after each 24 hours increment of exposure until the test is completed.

### E X P L A N A T O R Y   N O T E

In the preparation of this standard, considerable assistance has been derived from SAE J 1409 Mar 1983 'Air brake valves test procedure', issued by the Society of Automotive Engineers (SAE), USA.

This standard forms an important adjunct to the following Indian Standards:

IS : 11852 (Part 4)-1987 Recommendations for brakes and braking systems for automotive vehicles: Part 4 Compressed air and air assisted brakes — Special requirements.

IS : 11852 (Part 5)-1987 Recommendations for brakes and braking systems for automotive vehicles: Part 5 Compressed air and air assisted brakes — Pressure test connections.